

STATE OF ALASKA

Jay S. Hammond, Governor

Annual Performance Report for

INVENTORY AND CATALOGING OF SPORT FISH AND
SPORT FISH WATERS OF WESTERN ALASKA

Part B: Innoko River and Sheefish
Adaptability Studies

by

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RESEARCH PROJECT SEGMENT

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ABSTRACT

Results are presented of the first year of a 2-year study of the fish of the Innoko River drainage. Emphasis the first year study was on sheefish, Stenodus leucichthys (Güldenstadt), movements. Sheefish were present near Shageluk Eddy on the Innoko River by late May. Sampling throughout the remainder of the summer captured sheefish from the Innoko River mouth upstream to the mouth of Dishna River. Fish captured included prespawning, non-spawning and immature fish. No prespawning fish were captured or observed in the upper Innoko River above Dishna River. Spawners may leave the Innoko and enter the Yukon River via Shageluk Slough, as one of 58 sheefish tagged in the Innoko was recovered 3 months later migrating up the Yukon River.

Considerable information on food habits, age and growth, and distribution of Innoko River sheefish was collected during 1981 but will be reported on at the conclusion of the 2-year study in 1982 (1983 publication). Additional information on life history and ecology of broad whitefish, Coregonus nasus (Pallas), humpback whitefish, Coregonus pidschian (Gmelin), least cisco, Coregonus sardinella (Valenciennes) and northern pike, Esox lucius Linnaeus was collected and will be reported on later.

Utilization of sheefish, pike, and whitefish in the Innoko is mainly for subsistence by Shageluk and Holy Cross residents. Recreational use is presently low.

Results of an ongoing sheefish adaptability study are presented. Sheefish at the newly constructed Clear Hatchery were successfully reared to fingerling size in 1981. Fingerlings were stocked in Silver Fox Pit, Weigh Station Ponds, Craig Lake and Lakeview Pond. Lakeview Pond fish averaged

130 mm after 6 months stocking. Fry were stocked in five additional lakes and ponds in the Fairbanks-Delta Junction area. The capture of an Age III mature female and Age II mature males in Eielson Cooling Pond represents the youngest age at maturity for sheefish in Alaska.

KEY WORDS

Sheefish, stenodus leucichthys (Güldenstadt), interior Alaska, Innoko River, movements, use, hatchery sheefish.

BACKGROUND

Preliminary surveys of the lower Innoko River in late June 1979 indicated the presence of large numbers of sheefish. With completion of sheefish research in the Kuskokwim system in 1980, it was decided to undertake a 2-year sheefish research project on the Innoko River, but to include a basic stream survey and collect biological information on other species inhabiting the Innoko, especially whitefish and pike. With the considerable time and effort devoted to other species it was decided to change the project title from R-II to G-I-P (Catalog and Inventory). Basic life history studies of sheefish in other drainages in Alaska, as well as most of the Yukon River have been completed and published. Population status of sheefish in the Yukon River is fairly well understood. The majority of sheefish in the Yukon River in Alaska belong to a large anadromous population which overwinters in the lower Yukon River, including the brackish water environment. Spawning occurs in the Koyukuk and Alatna Rivers and upstream of the Dalton Highway bridge across the Yukon River. There are numerous small local populations both within and outside the range of the anadromous population (Nowitna River, Minto Flats, upper Yukon River, upper Porcupine River). It is not known if the Innoko River sheefish constitute a separate local population similar to Nowitna River sheefish or if the Innoko is another spawning area for the anadromous lower Yukon population. Another possibility is that the Innoko River is simply a feeding stream for sheefish of the lower Yukon population, with fish later in the summer taking part in the upstream spawning migration in the Yukon River. Determining patterns of movement and population status of Innoko River sheefish will be the main emphasis of this 2-year study. Life history information on pike and whitefish will also be collected. Figure 1 depicts the Innoko River drainage. Table 1 lists the common and scientific names and abbreviations of fish found in the study area.

RECOMMENDATIONS

Research

1. To continue the second year of the Innoko River sheefish study under a catalog and inventory study and concentrate efforts on pike and whitefish, as well as sheefish.
2. To complete the physical survey of the Innoko River system.

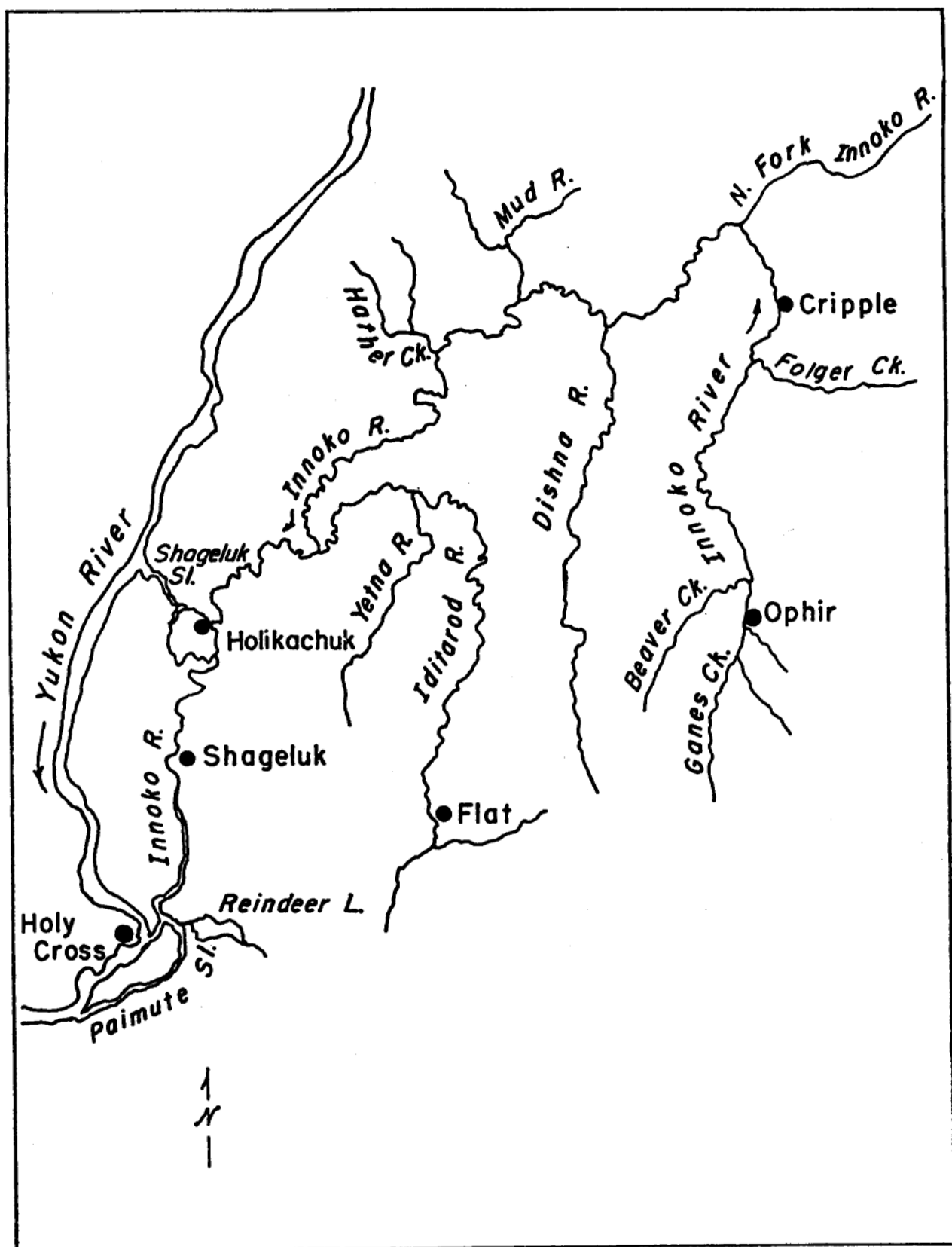


Fig. 1. Innoko River study area.

Table 1. List of common names, scientific names, and abbreviations of fish found in study area.

Common Name	Scientific Name and Author	Abbreviation
Arctic char	<u>Salvelinus alpinus</u> (Linnaeus)	AC
Arctic grayling	<u>Thymallus arcticus</u> (Pallas)	GR
Broad whitefish	<u>Coregonus nasus</u> (Pallas)	BWF
Burbot	<u>Lota lota</u> (Linnaeus)	BB
Chinook salmon	<u>Oncorhynchus tshawytscha</u> (Walbaum)	KS
Coho salmon	<u>Oncorhynchus kisutch</u> (Walbaum)	SS
Chum salmon	<u>Oncorhynchus keta</u> (Walbaum)	CS
Humpback whitefish	<u>Coregonus pidschian</u> (Gmelin)	HWF
Inconnu (sheefish)	<u>Stenodus leucichthys</u> ["] (Guldenstadt)	SF
Lake chub	<u>Couesius plumbeus</u> (Agassiz)	LC
Lake trout	<u>Salvelinus namaycush</u> (Walbaum)	LT
Least cisco	<u>Coregonus sardinella</u> (Valenciennes)	LCI
Longnose sucker	<u>Catostomus catostomus</u> Forster	LNS
Northern pike	<u>Esox lucius</u> Linnaeus	NP
Round whitefish	<u>Prosopium cylindraceum</u> (Pallas)	RWF
Slimy sculpin	<u>Cottus cognatus</u> Richardson	SSC

3. To search for spawning grounds of sheefish and whitefish in the Iditarod River.

Management

1. To survey fishing utilization and sport fishing potential of the Innoko River system.

OBJECTIVES

1. To stock various lakes and ponds in interior Alaska with sheefish fry and fingerlings.
2. To evaluate success of past sheefish plants.
3. To survey new waters for experimental stocking.
4. To determine movements, run timing and distribution of sheefish in the Innoko River system.
5. To collect basic life history information, especially age and growth and food habits, from Innoko River sheefish.
6. To locate Innoko River spawning grounds and collect data on spawning ecology of Innoko River sheefish.

TECHNIQUES USED

Innoko River surveys were conducted by riverboat from Fairbanks with supply points at Galena and Grayling. A raft was used to float the extreme upper reaches of the Innoko River in late September.

Fish were collected by gill net, seine and hook and line. Sampling was conducted in the main river and interconnected lakes and sloughs. Scales were collected for aging from all species except char, for which otoliths were used. Cleithrum bones were collected for pike aging. They were cleaned of skin and meat, and the annular rings were read using low magnification or held up to the light and read without magnification. Char gill rakers and pyloric caecae were counted in the field. Sex and maturity of fish were determined through gross examination of the gonads. Sheefish were tagged with orange spaghetti tags. Rewards for returned tags were paid by the Division of Commercial Fisheries. Information on fish utilization, distribution, and abundance, as well as insight into stream characteristics was obtained through conversation with residents of McGrath, Shageluk, Ruby and Holy Cross.

Egg takes and sheefish stocking were conducted in cooperation with the F.R.E.D. Division of Alaska Dept. of Fish and Game. Fry and fingerlings were placed in well-oxygenated plastic bags filled with chilled water. Transport was by vehicle and backpack.

FINDINGS

Innoko River Study

Movements:

Summer Movements. Preliminary movements of sheefish in the Innoko River were determined by test netting, discussion with local residents and a tag and recovery program. Sheefish were already present at the mouth of Holikachuk Slough and Shageluk Eddy by May 23. The feeding sheefish included both potential spawners and non-spawners. Greatest abundance at this time was correlated with the downstream migration of chum salmon fry on May 28-29. The few fish caught in test net sites in the lower Innoko drainage (Red Wing Slough, Paimiut Slough, Reindeer Lake) on May 25-27 indicated that the movement into the Innoko had probably occurred prior to this time. The catch of 0.7 sheefish per net night in the lower Innoko contrasted with 17 sheefish per net night at Shageluk Eddy (Table 2).

In mid-June sheefish were still feeding in the area of Shageluk Eddy. They were smaller than fish taken in May. Sheefish were also feeding in the Innoko River 8-12 miles upstream of Holikachuk and in the lower Iditarod River in mid-June.

In late August and early September test netting indicated presence of a few sheefish at Holikachuk Slough mouth, Iditarod River mouth, lower Iditarod River and Dishna River mouth, but none further upstream. Except for two prespawning males in the lower Iditarod River all fish were non-spawners. Test net data did not indicate a spawning migration to the upper Innoko even though residents familiar with the upper river mentioned capturing sheefish in the upper Iditarod near Flat, and in the Innoko River near Cripple, Folger Creek and North Fork Innoko in late September and October. The fish were possibly summer feeders, as none of the informants recalled seeing large-sized eggs.

Spawning Movements. Prespawning sheefish were present at the mouth of Holikachuk Slough and at Shageluk Eddy by May 24. Spawners evidently enter the Innoko River with non-spawners during breakup or may possibly overwinter in the Innoko River. Percentages of spawners of fish captured in the Innoko River during 1981 included 56% in May, 73% in June and 14% in August and September (Table 3). No spawning fish were captured further upstream than the lower Iditarod River.

Interstream Movement. There is some movement of sheefish between the Innoko River and the Yukon River. A tagged sheefish was recovered on the Yukon River 18 mi below Ruby on August 26. This was the only recovery of sheefish tagged on the Innoko in 1981 out of 58 fish tagged. The fish was tagged on May 30 on feeding grounds at Shageluk Eddy. The larger size of fish tagged in late May ($\bar{x}FL = 709$ mm, $n=20$) vs the 692 $\bar{x}FL$ ($n=30$) tagged in mid June indicates that some spawning fish may have moved further up the Innoko or back down into the Yukon before continuing on their migration to spawning streams.

Table 2. Test net results in the Innoko River and tributaries, 1981.

Location	Date	Net Nights	Species Captured									
			SF	HWF	BWF	LCI	NP	CS	SS	GR	Others	
Mouth Holikachuk Sl	5/24	2	3	2	8	4	10					
Holikachuk Lake	5/24	1		6	2		8					
Shageluk Eddy	5/25	2	3	24	72	53	25				1 BB	
Lake Slough below Shageluk (A)	5/26	2		10	6	1	16					
Lake Slough below Shageluk (B)	5/26	2		4	2	2						
Innoko R. mouth	5/27	1	2				1					
Railroad City Slough	5/27	1		1	4	4	8					
Mouth Paimute Slough	5/27	1	2		2		1					
Reindeer Lake Slough	5/28	2		6	4	4	10					
Paimute Slough	5/28		3		2		2					
Shageluk Eddy	5/29	2	2	4	1		28					
Shageluk Eddy	6/13	2	4	2	1	1	2	5				
2 Mi up Iditarod R.	6/16	3	1	36	9	4	15	1				
Iditarod R. mouth	6/16	4		10	4		24	1			1 LNS	
Mouth Holikachuk Sl.	6/18	2	3	6	1		9					
Shageluk Eddy	6/19	2	5	1				30			1 KS	
Holikachuk Sl. Mouth	8/30	2					5				2 AC	
											1 LNS	
Iditarod R. Mouth	8/30	4	4		3		14		1			
2 Mi up Iditarod R.	9/1	2	2		4	10	15		1			
Innoko R. @ Hather Creek	9/2	2			2		7		20			
Hather Creek	9/2	1					5					
Dishna R. Mouth	9/3	3	2	1	1		29		23			
Innoko R. @ N. Fork	9/4	1		17			7					
North Fork Innoko	9/4	1		3			3					
Innoko 10 mi above N. Fork	9/5	3		2		6	6		13			
Innoko R. Cripple Area	9/7	2		3		3			4			
8-20 Mi up N. Fork	9/8	4		2	2		13				1 RS	
Innoko Above N. Fork	9/9	4		11		13	17		17		1 AC	
Innoko Above Cripple	9/10	4		13		26	6		29	2	1 LNS	
Innoko @ Beaver Cr	9/29	1							7	9	1 RWF	
Innoko R. 40 mi below Ophir	9/30	1					1		2			
Innoko R. Folger Creek	10/1	1		3		2	1		4	2		
Innoko R. 8 mi above Cripple	10/2	1		3		4	1		3	3	1 LNS	

Table 3. Sex and maturity of sheefish captured in the Innoko River, 1981.

Sampling Period	No.	Sex and Maturity	Location
May	1	M* - Developing	Holikachuk Slough
	2	M - Spawner	Shageluk Eddy
	1	M - Spawner	Innoko R. at Holikachuk
	1	M - Spawner	Shageluk Slough Eddy
	1	M - Spawner	Mouth of Redwing Slough
	1	F - Developing	Shageluk Eddy
	1	F - Developing	Innoko River at Holikachuk
	1	F - Redeveloping	Shageluk Eddy
Mid June	7	M - Spawner	Shageluk Eddy
	2	M - Spawner	Holikachuk Slough Mouth
	1	M - Spawner	Lower Iditarod River
	2	F - Developing	Shageluk Eddy
	1	F - Spawner	Shageluk Eddy
	1	F - Redeveloping	Shageluk Eddy
	1	F - Developing	Holikachuk Slough Mouth
Late Aug.-Sept.	2	M - Developing	Innoko River at Iditarod
	1	M - Developing	Innoko River at Dishna
	1	M - Spawner	2 mi up Iditarod River
	1	F - Developing	Innoko River at Iditarod River
	1	F - Redeveloping	Innoko River at Iditarod River
	1	F - Redeveleoping	2 mi up Iditarod River
Total:		20 Males (16 Spawners 4 non-Spawners)	
		11 Females (1 Spawner 10 non-Spawners)	
Summary:		May 5 out of 9 (56%)	prespawners
		June 11 out of 15 (73%)	prespawners
		Aug.-Sept. 1 out of 7 (14%)	prespawners

* M = Male
F = Female

Distribution:

Based on 1981 test-netting results, sheefish are limited mainly to the mainstem Innoko River. Extensive netting was conducted in small lakes and sloughs of the Innoko below Holikachuk and no sheefish were captured (see Table 2). It appears that many of the smaller tributary streams e.g., Grouch, Mud, Hather, Folger & Beaver Creeks, do not contain sheefish. They were, however, captured in the lower Iditarod River and more netting is planned for the upper Iditarod in 1982 to determine if spawning fish might use this area. Sheefish were captured at the mouth of the Dishna River but no nets were set further up this major tributary. Residents of McGrath familiar with the Dishna River had no knowledge of sheefish in this stream. Sheefish probably do not utilize the North Fork Innoko River, as none were taken during 4 nights of fishing. The stream did not appear suitable for sheefish.

In spite of extensive netting in the Innoko River between Ophir and Dishna River (approx. 280 mi) no sheefish were captured. Large catches were made of coho salmon, pike, least cisco, and broad and humpback whitefish. Areas that appeared to have habitat suitable for sheefish spawning were found upstream and downstream of Folger Creek mouth. Trappers had reported capturing sheefish in the first pool area above Cripple Landing and at the mouth of the North Fork Innoko in October by net and near the mouth of Folger Creek in late September on hook and line. A guide operating a lodge at Cripple Landing featured sheefish fishing along with pike and grayling. Thus, sheefish are distributed at least in some years in the main Innoko up to the mouth of Folger Creek. It is not known if increased mining activity in recent years might have caused sheefish to cease their migrations to this upper area. People who had knowledge of sheefish presence in the upper Innoko could not positively identify the fish as spawners. Thus, fish reported may have been non-spawners.

Age, Growth, and Food Habits:

Data are still being collected and will be reported on in 1983.

Utilization:

During 1981 the utilization of sheefish in the Innoko River was quite small and consisted mainly of the Shageluk Village subsistence harvest, which the author estimates at less than 500 fish. The main body of sheefish generally migrate slightly later than the humpback and broad whitefish and are taken only in small numbers from late May through October. Whitefish and salmon are the target species for Shageluk residents.

Sheefish are available for sport fishermen in various feeding areas located generally upstream of Shageluk to the Iditarod River. During 1981 all sheefish caught on rod and reel by survey crews were taken between the mouth of Shageluk and Holikachuk Sloughs in the Innoko River. Small numbers were taken by gill net from Holikachuk Slough upstream to the mouth of the Dishna River (220 mi) but, despite extensive hook and line effort, none were captured on sport gear. The sport harvest by Holy Cross, Shageluk and Grayling residents is very low. Anglers from McGrath reported occasionally capturing sheefish on hook and line near Folger Creek in the

upper Innoko, and trappers reported capturing sheefish for dog food in the upper Iditarod River near Flat, at the mouth of the North Fork Innoko and in the main Innoko above Cripple. We captured no sheefish on hook and line in these upriver areas in September and early October. The upper Iditarod will be surveyed in 1982. The Iditarod and Innoko were extremely turbid from early June to October 5 and whether heavy mining activity has altered sheefish movements remains to be seen.

Sheefish Adaptability Study

1981 Egg Takes:

Egg take efforts in 1981 were directed mainly at the Koyukuk River above Hughes, but an experimental egg take was conducted in the Yukon River near the Ray River. Only two females were captured in the Yukon River and 90,000 eggs were taken from one female before abandoning the project. Ten females had already yielded 800,000 eggs at Hughes. In 1982 all sheefish eggs will be taken from Yukon River fish. It is believed that sufficient numbers of females can be captured by expanding the 1981 operation and arriving at the egg take site earlier in September.

Hatching of eggs began in late December 1981 and was completed by January 15, 1982. Hatching success was 48%.

1981 Sheefish Stocking

Silver Fox Pit:

Silver Fox Pit, located 54 miles south of Fairbanks on the Richardson Highway, was stocked with 200 fingerlings on June 29. The lake has 2.5 surface acres and is 12 feet deep. The pit has a resident population of lake chubs. Water temperature on June 29 was 16°C. Fish stocked ranged in length from 36 to 52 mm and were in good condition. Mortality was estimated at 10% at stocking. Chubs immediately moved in to eat dead and weakened fish. The lake had previously been stocked with 10,000 fry in February of 1969, all were probably eaten by chubs as none were captured in subsequent sampling.

Weigh Station Ponds:

These two man-made ponds are located 6 miles south of Fairbanks on the Richardson Highway. North Weigh Station Pond is 2.6 acres in size, while South Weigh Station Pond is 1.8 acres. Both contain chubs. North Weigh Station Pond is 32 feet deep, while South Weigh Station Pond is 30 feet deep. On June 29, 320 fingerling sheefish were stocked in the north pond and 280 fingerlings in the south pond. Observed mortality was 10 fish in each pond.

Gull Lake:

Gull Lake is an 8-acre lake, 20 feet deep, located on the Ft. Greely Military Reservation. The lake has a sand and silt bottom and a rocky shoreline. Slimy sculpins are the only fish species present. Twenty thousand sheefish fry at 30,000/lb were stocked under the ice on January 19.

Sheefish were observed surfacing over the entire lake on July 26. Fish sampled on this date were 118 to 128 mm FL and were feeding on emerging Diptera adults. Eight sheefish were captured in a 25-foot gill net set overnight.

Texas Lake:

Texas Lake is a 20 acre lake located on the Ft. Greely Military Reservation. This barren lake has a maximum depth of 18 feet. Fifteen thousand sheefish fry were stocked on January 19. A fyke net set overnight in August took no sheefish.

Manchu Lake:

This 100-acre lake on Ft. Wainwright Military Reservation was stocked with 40,000 fry on January 19, 1981. It was not test netted in 1981.

Eielson Cooling Pond:

Eielson Cooling Pond was stocked with 10,000 fry on January 19, 1981. It had previously been stocked in 1977, 1978 and 1979. The majority of fish captured in subsequent years were from the 1977 plant. No fish of the 1978 plant and only two fish of the 1979 plant had been captured prior to 1981.

Two sheefish were captured in 6 net nights of fishing, March 18, 1981. Both fish were females (527 and 522 mm) and both contained numerous loose eggs in their body cavities, indicating failure to spawn in the fall of 1980. In October 1981 five sheefish were captured during 2 net nights of fishing. One fish, 555 mm Age IV, was from the original 1977 plant; two fish, 595 and 515 mm females, Age III, were from the 1978 plant, and two fish, 500 mm and 566 mm males, Age II, were from the 1979 plant. The Age IV fish was a mature male, the larger Age III female was ripe, while the 515 mm fish was immature. Both Age II males were mature. This is the first recovery of sheefish from the 1978 plant of less than 1,000 fish. The recovery of Age II males in spawning condition is the youngest spawning age for males recorded in Alaska. All fish captured in October had empty stomachs.

Lakeview Pond:

Lakeview Pond is a barren, 30-acre man-made pond just south of the Fairbanks city limits. Late winter 1980 dissolved oxygen reading of 4.5 ppm indicated that suitable conditions existed for stocking fish. On May 10, 1982 about 10,000 fingerlings (22-36 mm FL) were stocked. Twenty-two fish were caught in 4 net nights of fishing an experimental gill net set under the ice on Nov 11-12, 1981. Ten fish sampled ranged from 120-139 mm FL (\bar{x} = 130mm) and 14-20g (\bar{x} = 16.3g). Seven of the 22 fish had deformities of the jaw, including six short upper jaws and one shortened and offset lower jaw. Forty percent of the fish sampled contained Daphnia sp. in their stomachs, the only food item eaten.

Craig Lake:

Craig Lake is a 17-acre lake located 137 miles south of Fairbanks on the Alaska Highway. Maximum depth is 75 feet. The lake had been stocked with

coho salmon and rainbow trout from 1960-1974. Stocking was discontinued after lake chubs became established in the lake.

A total of 3,400 sheefish fingerlings at 500 fish to the pound (FL = 30-56 mm) was stocked on June 29, 1981. Fish were in poor condition because of extensive time in transport. Three hundred dead fish were observed.

South Greely Pond:

South Greely Pond was stocked with 10,000 fry in February 1977. Sheefish were first captured in 1980 when 38 fish with a mean fork length of 444 mm were taken during 2 net nights of fishing. In 1981, 17 fish were captured on hook and line in 2 hours of fishing; all were released.

Evaluation of new waters for stocking

In 1981 Nenana Pond and Harding Lake were evaluated for future stocking. Nenana Pond is a 10-acre lake located 2 mi south of Nenana and adjacent to the Nenana River. The lake had previously been stocked with grayling and rainbow trout, but northern pike and suckers were carried into the lake by flooding. Sport fishing success has been very low the past 2 years and, since the Sport Fish Division has no plans to rehabilitate the lake, stocking of fingerling sheefish is contemplated. It is hoped that the fingerlings will survive in sufficient numbers to be effective predators on other species present.

Harding Lake:

Harding Lake is a 2,470-acre lake located on the Richardson Highway, 45 miles southeast of Fairbanks. The lake has a mean depth of 53 feet and maximum depth of 142 feet. The fish population includes northern pike, burbot, least cisco, slimy sculpin and the introduced species lake trout and coho salmon. From 1963-1965, 500 adult lake trout were stocked. A few continue to be caught in Fish and Game Department test gill nets, but very few have been caught by anglers. From 1969-1978, 2.3 million coho salmon fingerlings were stocked in Harding Lake. The return to the anglers creels has been low. Thus, the main sport fish contribution of Harding Lake fish is pike caught on hook and line in the summer and speared through the ice in winter and burbot captured through the ice. Populations of least cisco have increased during the past 2 years as stocked coho salmon have completed their natural life cycle. In lake and river systems in Northwest Alaska, least cisco are the primary food source of sheefish. It is expected that stocked sheefish would utilize least cisco. Sheefish fingerlings, if available, would be stocked in mid-summer 1982.

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